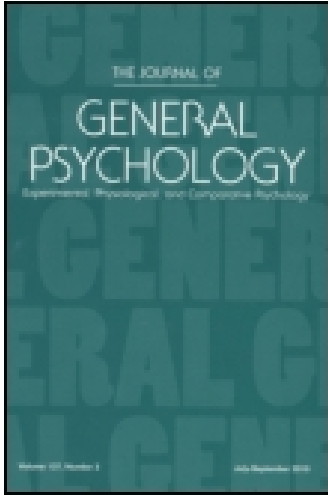




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Drive and Reflex Strength

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DRIVE AND REFLEX STRENGTH*

From the Psychological Laboratory, Harvard University

B. F. SKINNER

I

We say that an animal is hungry if, when we give it food, it eats. We also say it is hungry if it responds in characteristic ways to an empty food dish, to the approach of the experimenter, or, in short, to any stimulus that has been conditioned to behavior in some way concerned with eating. In the absence of such specific stimulation, we may say that the animal is hungry if it shows what has unfortunately been called spontaneous activity, although we cannot in such a case distinguish between hunger and some other drive until a stimulus leading to a specific response has been introduced. In our everyday use of the word only the first of these conditions is important, for we ordinarily attribute hunger to an animal only because it eats or because it exhibits behavior that we have frequently observed to be followed by eating. In the latter case the use of the word rests upon the conditioning of the experimenter.

When we use the term hunger, therefore, we are describing the presence or absence, the display or want of display, of certain characteristic behavior. Thus we are concerned with the fact that an animal eats, or that it does not; that it approaches an empty food dish, or that it does not; that it runs in a running wheel, or that it does not; and so on. The question of hunger arises only because the behavior of an organism may exhibit alternatives of this sort.

The central problem in the study of hunger, then, is to account for the appearance or non-appearance of a given sort of behavior at a given time. To this end we may try to show that the appearance of a given piece of behavior is a function of some designated variable, for example, of time. The conditions of an experiment to determine the nature of that function will be fairly simple. We have only to place an animal in a familiar cage with a supply of food, eliminating,

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so far as possible, all incidental stimuli, and to observe the times at which it eats. Such an experiment was performed, as is well known, by Richter (2), who found that over periods of time of the order of magnitude of days a white rat shows an orderly periodicity in its eating activity.

But the simple observation of whether a rat eats is, after all, only an all-or-none measure, while we may (and almost always do) treat hunger as a matter of degree. If we place a very hungry rat with a supply of food in a controlled situation, it will eat for perhaps two hours and then stop. In such an instance we should say that the hunger of the animal has undergone a marked change in degree and has eventually disappeared. An adequate description of hunger must account for a change of this sort.

In such a case what have we actually observed? We are likely to have noted first of all that the speed of each component part of the rat's behavior gradually slackened, and that the various parts of a coordinated movement followed each other less and less quickly. Another change may have been evident in the length of the interval between the eating of successive pieces. At first this interval was probably scarcely observable, but it became more and more marked and may have reached the length of four or five minutes before the rat stopped eating altogether. We may also have observed that, whereas at the beginning of the period the rat came immediately to the food, it did not (if we removed and returned the food) do so as promptly later on. Further, we may have observed that it became less and less difficult to inhibit the eating behavior with extraneous stimuli.

The experimental isolation of any one of these changes is difficult and in some cases apparently impossible. A combined measure of several is available, however, in the *rate* at which the rat eats. This rate is obviously determined by some of the factors we have listed: the speed of the component movements, the interval between the eating of successive pieces, and so on. As a first experimental step, then, we may examine this rate as a function of time from the beginning of an eating period.

II

A standard food is prepared by pressing a stiff mash (McCollum's formula) into strings, which are then dried and broken into pellets weighing 15 (in some cases 20) to the gram. (Recently a machine

built on the model of a druggist's pill-machine has been used, which yields pellets of a more uniform shape). By preparing the food in this way one reduces the rate of eating to the rate at which these standard pieces are taken up by the rat, and this may be recorded mechanically with the aid of the following devices.

A food tray is constructed as shown in Figure 1*A*. The rat stands on the platform at the left and obtains food from the pocket at the right. The food is placed below the level of the platform so that the rat must withdraw from the tray before eating. In obtaining food the rat pushes inward the light door that hangs in the opening to the food pocket. The door is counter-balanced and moves with great ease. When the door is opened, a contact is made at *A*, and these contacts are recorded as described below. A screen not shown in the drawing shields the flash of the contact from the animal. A small bellows, the use of which is described later, is shown at *B*. The drawing is not exactly to scale, and the door is free to open farther than is here indicated. The device is about 10 inches high. In the model used, two of these pockets stand at the end of a common platform, one of which contains water.

Unfortunately, such a device is not entirely adequate. A rat will frequently "rattle" the door in taking a piece of food, thereby making more than one contact. To eliminate this effect a special device is introduced into the circuit to the recording lever, as shown schematically in Figure 1*B*. A wooden disc (*A*), 6" in diameter and weighing about a pound, is suspended on four strings, 18" long, fastened near the center of the disc. A pin is driven into the base through a hole in the center of the disc, which revolves freely about it. The disc is twisted several times in a clockwise direction until it tends to turn in the opposite direction with some slight force. A small arm on the disc is then arranged to come to rest against the soft iron armature of a coil magnet (*B*). The latter kicks the disc in a clockwise direction when the magnet is activated. The disc is adjusted to make nearly a full revolution; it then turns back and comes to rest against the armature.

The circuit from the food tray coming in at the lower right-hand corner of the drawing goes directly to the magnet (*B*) but to the recording lever only through a second contact at *C*. When the rat opens the door of the tray, both the magnet (*B*) and the recording lever are activated. But the circuit to the recording lever is immediately broken at *C* by the action of the disc and remains broken

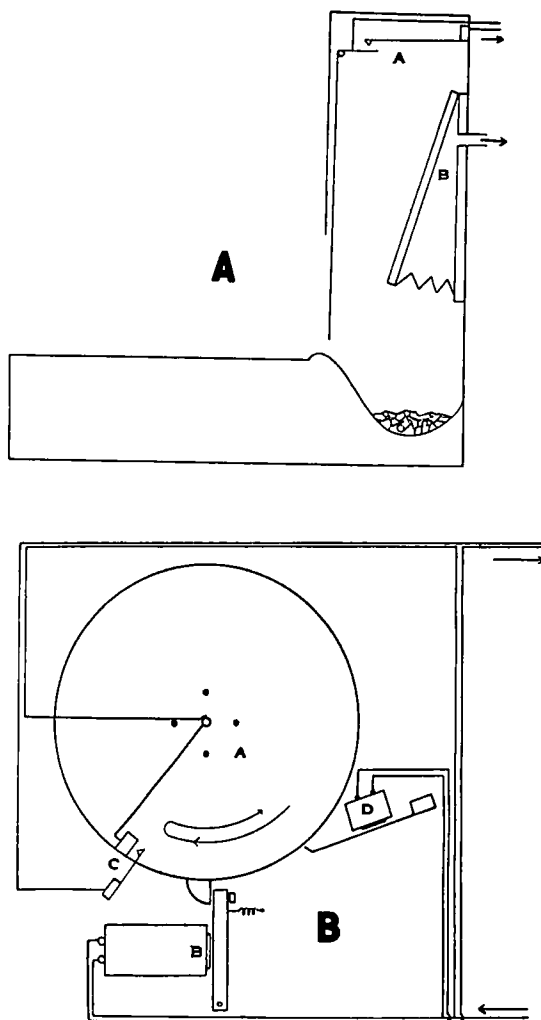


FIGURE 1

A. Longitudinal section of food tray, showing contact (A) and small bellows (B).

B. Plan of device to eliminate superfluous contacts. See text.

until the disc has returned to rest. Superfluous contacts are thus kept from the recording device, and by altering the weight of the disc a suitable interval may be obtained that will restore the circuit for the next legitimate contact. Additional protection against a premature return of the disc is afforded by another coil magnet at *D* which holds a light lever against the disc to prevent its return while the contact in the food tray is held closed.

An experimental box, 55 cm. long, 50 cm. wide, and 20 cm. deep, built of double walls of "Celotex" and mounted upon rubber blocks, is inclosed in another "Celotex" box, also mounted upon rubber. Both boxes are placed in a semi-soundproof experimental room. The experimental box is dark throughout the experimentation and is continuously ventilated with a slow stream of washed air pumped through a small tube from an adjoining room. Most of these precautions have been found necessary for the success of an experiment. The food and water trays are set inside and against one wall of the experimental box. The recording instruments are in an adjoining room.

Adult albino rats of the King inbred strain, of the 65th and 66th generations of brother-sister inbreeding, have been used. At the same hour daily a rat is taken from the animal room and placed in the experimental box with an ample supply of food and water. The box and the room are then darkened and closed for the duration of the experiment. Ordinarily the rat is left in the box until at least 30 minutes have elapsed during which no eating has taken place, as shown on the records in the adjoining room. The rat is then removed from the box, returned to the animal room, and given about five grams of surface-dry lettuce leaf. No other food is given to it.

In recording the contacts a simple signal lever writing upon a kymograph drum would suffice, but we are interested in *rate* and in changes in rate, and a slight modification in the method of recording simplifies the inspection and measurement of these aspects of the record. A writing point is mounted upon a small collar, which slides freely upon a vertical shaft. The collar is supported by a silk thread, which is wound about the shaft of a ratchet mounted at the top of the vertical shaft. The ratchet is turned one notch at each contact by a coil magnet. Thus, when the circuit to the coil is made, the ratchet turns one notch, the thread is wound slightly further about the shaft of the ratchet, and the writing point is drawn up a corresponding (and uniform) distance. The record of a series

of contacts is a step-like line traced diagonally upon the kymograph paper. The slope of the line varies with the frequency of the contacts, and the line is straight, of course, if the rate is constant. The record may be treated as a graph, and in the figures reproduced here suitable coordinates have been added.

In Figure 2 a typical record obtained with this procedure has been reproduced directly from the kymograph tracing. It will be seen from the curve that the rate of eating varies in an orderly fashion, beginning at a maximum and decreasing regularly throughout the period. It has been pointed out in an earlier report (3) that the typical curve closely approximates a parabola, and experiments made after an interval of a year, with a later generation of the same strain of rats, fully confirm that statement. The equation for the curve is

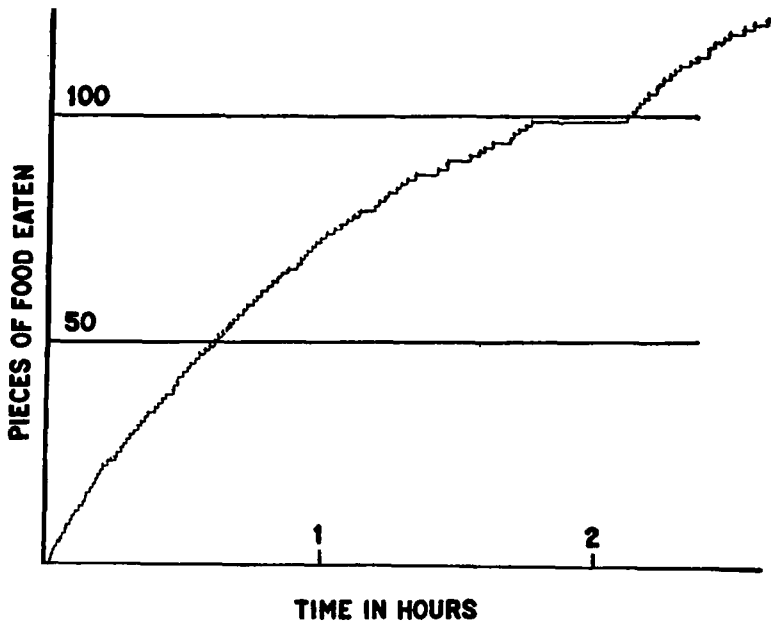


FIGURE 2

Kymograph record of the eating behavior of a white rat. At each elevation of the writing point the rat ate a pellet of food of standard size. The rate of eating is given by the slope of the line and can be seen to decrease regularly throughout the period of $2\frac{1}{2}$ hours. The curve is described by the equation $N=Kt^n$, where N is the number of pieces eaten at time, t , and K and n are constants.

$$N=Kt^n$$

where N = amount of food eaten at time, t , counted from the beginning of the period, and K and n are constants. The magnitude of n (the important constant in determining the nature of the curve) was given originally as 0.67 to 0.70. Recent determinations, where several parts of the earlier procedure have been modified, place it at approximately 0.70.

Figure 2 is not an exceptional record. Curves of equal regularity may be obtained daily, if the experiments are conducted with due care. There are, of course, minor deviations from a smooth curve. These are attributable to several factors. There is, first, the failure of the recording apparatus to follow the behavior of the animal, especially when this is atypical, as, for example, when the rat takes a piece of food from the tray, drops it, does not recover it, and returns again to the tray. In such a case two pieces will be recorded for one eaten. Accidents of this sort are fortunately infrequent. Secondly, there are irregularities in the behavior of the animal, which are correctly reported in the records, and which we must note in more detail.

It will be seen in Figure 2 that near the end of the second hour the rat stops eating, to begin again only after an interval of some 20 minutes. At the end of the interval the rat is, so to speak, considerably behind the schedule set for it by the earlier part of the curve. When it begins again, however, it eats at a greater rate, so that within half an hour the record has reached the extrapolation of the body of the curve. The rate is not constant during the period of recovery but falls off in much the same way as in the original curve. Following such an interval, the record has never been observed to go beyond the extrapolation of the main curve and probably falls slightly short of it in most cases.

Other minor examples of the same phenomenon may be discovered in Figure 2. A record is seldom obtained without them. The interruptions themselves may be accounted for in several ways. During some of them the rat drinks. This had been determined with a signal device attached to the water tray. Other delays may be attributed to urination and defaecation. The longer intervals in the latter part of the records cannot be so explained, and must be due to conflicting behavior of some other sort. The compensating increase following an interval raises a more difficult question and

one that is perhaps impossible to answer without postulating a mechanism to account for the curve itself. No hypothesis will be advanced here, but a few experiments that bear upon the process of recovery may be described.

A small bellows, as shown in Figure 1*A*, is arranged to press outward against the door of the food tray when inflated. The bellows is controlled from a source of compressed air in the adjoining room and permits the experimenter to lock the door to the tray without otherwise disturbing the rat. Intervals of any desired length may thus be introduced into a record, during which the rat cannot eat. In the following experiments the intervals are approximately 10 minutes long and are begun as soon as the general trend of the curve has been established or when about the thirtieth piece of food has been eaten.

Figure 3 shows a typical record obtained when the pneumatic lock

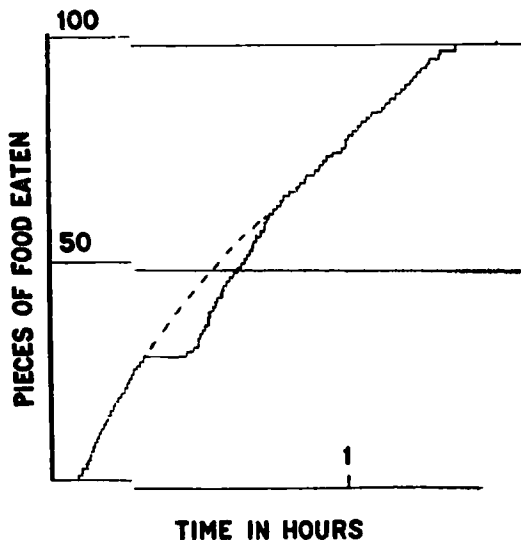


FIGURE 3

Kymograph record of the eating behavior of a rat, where the supply of food is cut off for ten minutes. The rat "recovers" from the interruption at an increased rate, so that the record reaches the extrapolation of the first part of the curve within twenty minutes. (The record has been cut and shifted vertically to correct for two contacts made accidentally by the experimenter.)

is used for the first time. The curve is interrupted, of course, and following the enforced interval the rat eats at an augmented rate. The extrapolation of the original curve is reached within 20 minutes. The recovery curve, however, differs significantly from that of Figure 2, as may be most clearly seen by foreshortening the records and sighting along the curves. In Figure 3 the recovery takes place at an approximately constant rate and the record shows a break where the original curve is reached. In Figure 2, on the other hand, the recovery shows a progressively diminishing rate and the original curve is approached asymptotically.

When the lock has been used several times, the curves begin to assume the character of the "normal" recovery. Enforced intervals had been introduced on two previous occasions when the record in Figure 4 was taken. Although a break is still discernible where the original curve is reached and the recovery is relatively slow, the curve has become convex and obviously similar to the normal recovery curve. An explanation of this change must, here again, presuppose some hypothesis for the curve itself. For the present we

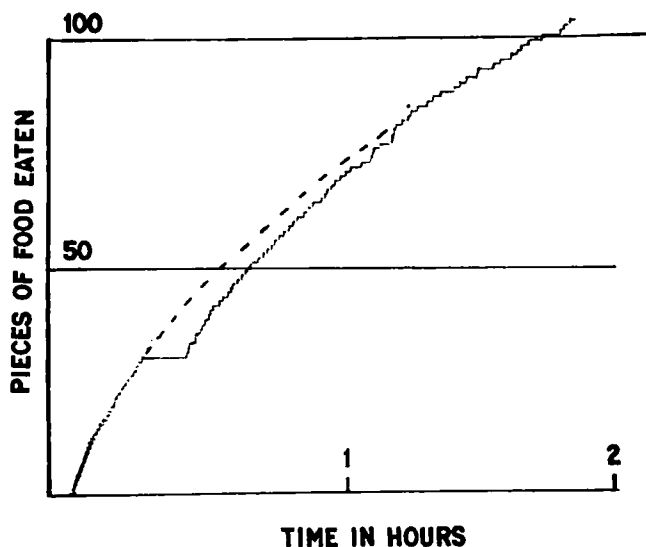


FIGURE 4

Record as in Figure 3, but upon the third occasion when the supply of food is cut off. For discussion see text.

may note simply that the "straight-line" recovery of Figure 3 is probably the resultant of a normal recovery and an emotional effect set up by the exclusion from the food tray. On subsequent occasions the emotional effect may adapt out, leaving the normal recovery curve. The possibility of determining the course of such an emotional effect through the analysis of records of this sort and the broader question of what is meant by an emotion in such a case are reserved for future discussion.

III

The problem of hunger arises, as we have seen, because the behavior of the intact organism shows a certain apparent variability. We have discussed a problem of this sort elsewhere, in an examination of the reflex as a concept in the description of behavior (4). There we saw in part that the description of behavior is concerned with at least two sorts of law. The first of these deals with specific uniform relationships between behavior and the forces acting upon an organism. A reflex is itself a law of this type, which describes the observed correlation of two events, a stimulus and a response. Supplementary laws (of threshold, latency, and so on) describe more exactly the conditions of such a correlation. The laws of the second sort, however, have no reference to the single elicitation of a reflex but describe changes observed during successive elicitations. Such are the laws of reflex fatigue, the refractory phase, summation, and so on. We left that discussion with the assertion that drive, emotion, and conditioning, so far as they concerned behavior, could be described with laws of the second sort. Let us see more exactly what this means, at least so far as it relates to the subject of drive.

The behavior of a rat in approaching, seizing, and eating a piece of food is, by assumption, reflex, or more accurately it is composed of a chain of reflexes, which are closely interwoven although they may still be specified and observed individually. In the latter part of the series the chaining is effected chiefly by the movement of the bolus of food, in the earlier by the movement of the organism in space; but in both cases the rule is the same: that the response to one stimulus brings up the stimulus for a subsequent response. In the initial members of the chain certain visual, tactual, and olfactory stimuli initiate movements of orientation, first of the head, then of the body, followed in turn by movements of progression. New stimuli are supplied internally and externally by every part of this

activity, and the lips of the animal are eventually brought into contact with food. Thereupon, seizing and chewing reflexes (studied, for example, by Magnus in the thalamic rabbit (1), and the usual swallowing reflexes, carry the food to the stomach, where it passes out of range of the present discussion.

But what is our justification for regarding the initial members of this chain as reflex in nature? *If it is in fact true that a rat's approach to a bit of food is reflex, why is the response not always evoked by the appropriate stimulus?* This is a convenient question. It will be recognized at once as typical of a very widespread criticism of the concept of the reflex. At the same time it epitomizes the present problem.

The inevitability of any reflex, the necessity of the relationship of any stimulus and response, rests ultimately upon observation: a response is observed to follow the administration of a stimulus and to be absent otherwise. But no reflex shows an absolute necessity of this sort. For example, the necessity is lacking during the absolute refractory phase and after complete fatigue. Necessity, moreover, implies a constant ratio of the values of stimulus and response, which is, nevertheless, seldom observed. No one will be likely to urge these exceptions against the validity of a reflex, for the conditions under which they are observed are almost always induced experimentally, with the result that the experimenter is provided with some means of accounting for an effect even before he has observed it. But such an appeal to a third variable (to a condition of the experiment, for example) will be fully satisfying only if the effect can be shown to be an exact function of the variable, and we ordinarily attempt to secure this satisfaction by demonstrating the nature of the function—for example, by discovering the “curve” for the refractory phase or for reflex fatigue. In this way we effectually eliminate a so-called variability by describing it. The same procedure is available in dealing with the problem of drive.

Before interpreting our present results, however, it will be necessary to mention a matter of terminology. Such a characteristic as reflex fatigue, as we have noted elsewhere, involves extensive changes in latency, threshold, after-discharge, and so on. Nevertheless, we ordinarily regard it as a unitary process. It is customary, for example, to measure only one of its aspects (for example, the change in after-discharge) and to assume that a variation observed there will exemplify the total process. But if we are asked *what* it is that

changes during reflex fatigue, we can answer only by detailing the specific factors of latency, magnitude of response, threshold, and so on. We lack a term to stand for the totality that undergoes the change. The physiologist thinking in terms of the synapse can speak conveniently of an increase in synaptic resistance or the exhaustion of a synaptic substance or state, and may attribute all the observed effects to this one change. If we wish to remain at the level of our observations, however, we must have a term that serves the same purpose without committing us to a physiological theory. We have suggested (4) the term "reflex strength," which is not new, although it has never been used in any very exact sense. The strength of a reflex is given by the value of its threshold, the ratio of the values of its stimulus and response, the duration of its latency, the amount of its after-discharge, and so on. It is thus a convenient term in describing a process that involves all these factors.

The instances of variability that raise the question of hunger are expressible in terms of reflex strength. The term accounts for the aspects of the behavior that indicate degree of hunger—which we may equally well speak of as characteristics of the component reflexes—and with the aid of the principle of a threshold it also accounts for the mere appearance or non-appearance of a response. Thus, to say that an animal is very hungry is only to say that certain reflexes concerned with the ingestion of food are strong. To say that an animal is not hungry is to say that the strength is below a threshold point. And so on. The theoretical value of this interpretation, beyond its present application, need not be discussed here.

The problem of hunger presents itself, then, as a variation in the strength of certain reflexes, a variation which ordinarily appears haphazard. The solution of the problem lies in the description of the variation. In the present experiment, accordingly, if we take the rate of eating to be a measure of the strength of these reflexes (an assumption that is reasonable in view of what we have already said), we find that the strength is an exact function of the time from the beginning of an eating period. This is demonstrated, of course, for only one from among an indefinite number of cases (corresponding to the number of possible experimental situations). But the instance is typical, and it seems a reasonable assumption that under other conditions the strength is also similarly determined.

What we have said for hunger holds equally well for other drives,

due allowance being made for a difference in the type of behavior involved. If we define any given drive wholly in terms of our observations, we shall find that it is a matter of whether or not a response is elicitable, or of certain quantitative aspects of an elicited response. In either event it is expressible in terms of reflex strength. Consequently, the experimental treatment of drive will take the form we have indicated: the examination of some measured aspect of strength as a function of some such variable as time.

It may be objected that in this discussion we have somehow omitted the heart of the problem. We have had little or nothing to say about a *something* called drive. Is this a real omission? The first form that this objection is likely to take is that we have failed to touch upon the physiological side of the subject. Drive, it may be argued, is, after all, a reference to a physiological state. Must we not seek for a definition in physiological terms? Now, that there are physiological conditions correlated with all aspects of behavior no one will be likely to question. But it is equally true that behavior may be adequately described without constant reference to its physiological correlates. In the present case the concept of drive arose in the description of behavior and is commonly used there when no knowledge of physiological conditions is available or thought necessary. The term attempts to deal with a special aspect of behavior, which, as we have seen, may be clearly defined, and with which we are here exclusively concerned. Doubtless the experimental result that we have obtained has a physiological significance, but its bearing upon the present discussion is negligible.

While it is obvious that the word drive refers to a *thing*, this is, from the present point of view, a verbal accident. So far as our observations are concerned, it is enough to say that an animal is hungry; it adds nothing to say that it possesses a certain amount of hunger. The use of the adjective is, of course, warranted by our present interpretation. The use of the substantive may be justified as a convenient hypostatization, although its use is likely to be abused. *Drive* never presents itself for investigation nor for measurement; the immediate experimental material is *behavior*. To assume that some measured aspect of behavior is a measure of drive is to carry the concept beyond any experimental justification, since, before a common factor of this sort can be set up to account for a group of observed aspects of behavior, it must be shown that all the variations

for which a change in the factor is supposedly responsible are of the same nature. Since this can be accomplished only through the investigation of the order of variation of particular instances, where the independent variable is a condition of an experiment; and since this is, as we have seen, the form that our investigation must take anyway, the concept of drive seems to have no experimental usefulness. The same criticism may, of course, be applied to the concept of reflex strength, if that term is taken beyond the simple operational definition that we have given it.

SUMMARY

I

When we use the term hunger we are describing the presence or absence, the display or want of display, of certain characteristic behavior. The central problem in the study of hunger is to account for the appearance of either case at a given time. The mere observation of whether or not a rat eats is not, however, an adequate experimental measure, since it neglects the matter of degree of hunger. An adequate measure of those characteristics of behavior upon which we base a judgment of degree is available in the rate at which a rat eats.

II

Under the experimental conditions described herein, the rate at which a white rat eats a daily ration of a standard food varies in a uniform way. The amount of food (N) eaten at any time (t) during an eating period is given by the equation

$$N = Kt^n$$

where K and n are constants.

A compensatory increase in rate follows any delay which tends to bring N below its predicted value.

III

The question of hunger arises from an apparent variability in the behavior of the intact organism. The significance of a problem of this sort has been discussed elsewhere in connection with the concept of the reflex. In reflex terminology, the problem of hunger presents itself as a variation in the strength of certain reflexes concerned with the ingestion of food. A solution is suggested, using the present experimental material as an example.

REFERENCES

1. MAGNUS, R. Körperstellung. Experimentell-physiologische Untersuchungen über die einzelnen bei der Körperstellung in Tätigkeit tretenden Reflexe, über ihr Zusammenwirken und ihre Störungen. Berlin: Springer, 1924. Pp. xiii+740.
2. RICHTER, C. P. Animal behavior and internal drives. *Quar. Rev. Biol.*, 1927, **2**, 307-343.
3. SKINNER, B. F. On the conditions of elicitation of certain eating reflexes. *Proc. Nat. Acad. Sci.*, 1930, **16**, 433-438.
4. ———. The concept of the reflex in the description of behavior. *J. Gen. Psychol.*, 1931, **5**, 427-458.

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L'IMPULSION ET LA FORCE DU RÉFLEXE

(Résumé)

I

Quand on emploie le terme faim, on décrit la présence ou l'absence, la manifestation ou le manque de manifestation, d'un certain comportement caractéristique. Le problème central dans l'étude de la faim c'est d'expliquer l'apparence de l'un ou l'autre cas à un temps donné. La seule observation si un rat mange ou s'il ne mange pas, n'est pas cependant une mesure expérimentale adéquate, puisqu'elle néglige le facteur degré de faim. Une mesure adéquate de ces traits de comportement sur lesquels on base un jugement du degré est à trouver dans la vitesse à laquelle un rat mange.

II

Dans les conditions expérimentales ici décrites, la vitesse à laquelle un rat blanc mange une portion quotidienne d'un aliment ordinaire varie d'une manière uniforme. La quantité de nourriture (N) mangée à n'importe quelle heure (t) pendant une période de manger est donnée par l'équation

$$N = K t^n$$

où K et n sont constants.

Une croissance compensatoire de la vitesse suit n'importe quel délai qui tend à réduire N au-dessous de sa valeur prédite.

III

La question de la faim remonte à une variabilité apparente dans le comportement de l'organisme intacte. La signification d'un problème de cette sorte a été discutée ailleurs à l'égard du concept du réflexe. Dans la terminologie du réflexe, le problème de la faim se présente comme une variation dans la force de certains réflexes qui entrent dans l'ingestion de la nourriture. On suggère une résolution, employant cette matière expérimentale comme exemple.

SKINNER

TRIEB UND REFLEXENSTÄRKE (REFLEX STRENGTH)

(Referat)

I

Gebraucht man das Wort 'Hunger,' so bezeichnet man damit die Gegenwart oder die Abwesenheit die Offenbarung oder den Mangel an Offenbarung einer gewissen charakteristischen Tätigkeit. Die Kernfrage bei der Untersuchung des Hungers ist es, das Erscheinen der einen oder der anderen Situation zu einer besonderen Zeit zu begründen. Die einfache Beobachtung, ob eine Ratte frisst oder nicht, stellt jedoch kein genügendes experimentelles Verfahren dar, da sie den Grad der Stärke des Hungers vernachlässigt. Es steht uns aber in der Schnelligkeit, mit der die Ratte frisst eine genügender Massstab jener Kennzeichen der Tätigkeit zur Verfügung worauf wir eine Abschätzung begründen.

II

Unter den hier beschriebenen experimentellen Bedingungen variiert die Schnelligkeit, mit der eine weisse Ratte eine tägliche Portion einer Normal-speise frisst, auf eine uniforme Weise. Es lässt sich die Quantität der zu einer gewissen Zeit (T) während der Fressperiode eingenommenen Nahrung (N) durch die Gleichung

$$N = Kt^n$$

darstellen, worin K und n Konstante sind.

Auf irgend eine Verzögerung die N unter ihren hervorgesagten Wert zu ziehen neigt folgt eine kompensatorische Beschleunigung der Schnelligkeit.

III

Die Frage des Hungers hat ihren Ursprung in der scheinlichen Variabilität des unversehrten Organismus. Die Bedeutung einer solchen Aufgabe ist anderswo besprochen worden, im Zusammenhang mit dem Begriff des Reflexes. In der Reflexeterminologie stellt sich die Aufgabe des Hungers dar als eine Variation in der Stärke gewisser Reflexe, die mit der Einführung von Nahrung zusammenhängen. Es wird eine Lösung vorgeschlagen, wobei das gegenwärtige Material als Beispiel dient.

SKINNER